Fatty Acid Profiles of New Zealand-Grown and Imported Pine Nuts

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Pine nuts (*Pinus* spp.) are becoming more popular in New Zealand cuisine and so their availability has increased.

They have a unique taste because they contain high levels of unsaturated fatty acids. They are an excellent source of dietary fatty acids, such as linoleic and oleic acids.

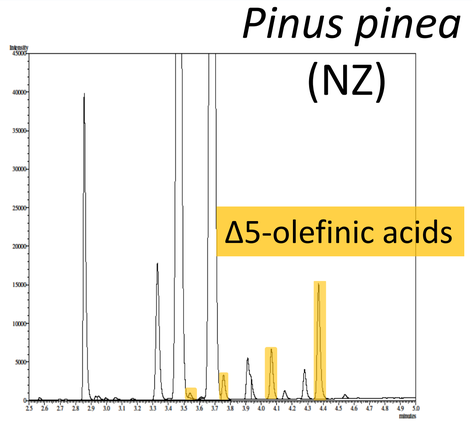
Pine nuts are either locally-grown or imported and informal reports suggest that each cultivar has a very different taste because of the different patterns of fatty acids found in each of the cultivars.

Five different cultivars of pine nuts were harvested from trees growing in Marlborough and the fatty acid profiles were compared to samples of pine nuts bought in local supermarkets.

Individual fatty acids in each sample of nuts were analysed using a fast-GLC/MS technique. Authentic fatty acid standards were also used to confirm the identity of each separated fatty acid peak. The analysis of five different cultivars of New Zealand grown pine nuts are shown in Table 1.

Table 1 reports the fatty acid profile and DI for Coulter and Torrey pine nuts for the first time while the Swiss pine fatty acid profile has been reported before, however, only as a mix with other pine nuts.

Pinus pinea
(NZ)



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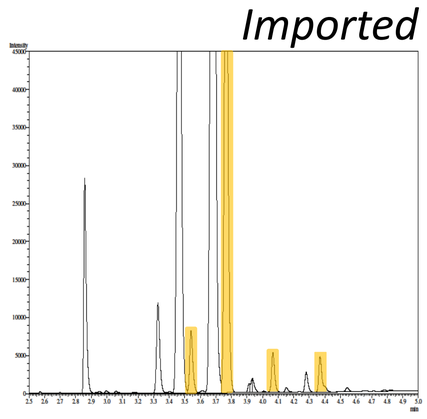

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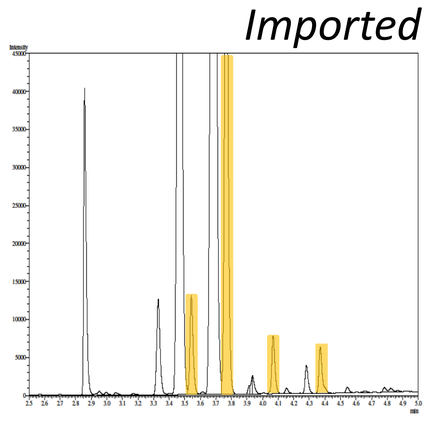

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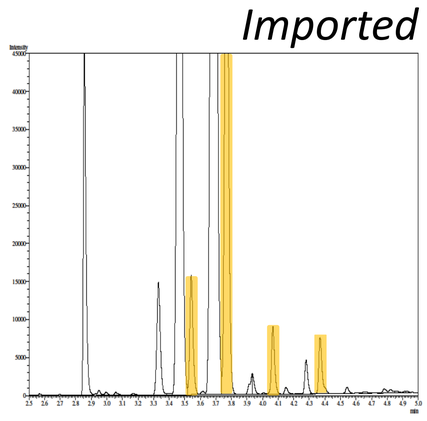

Pine nuts have a predominance of polyunsaturated fatty acids (PUFA), with linoleic and oleic acids being the most abundant.

Pine nuts also have a group of Δ5-olefinic fatty acids. These are characteristic to all gymnosperms and, specifically, pine nuts including: taxoleic (C18:2 cis 5,9), pinolenic (C18:3 cis 5,9,12), coniferonic (C18:4 cis 5,9,12,15), keteleeronic (C20:2 cis 5,11) and sciadonic (C20:3 cis 5,11,14).

Table 2. Fatty acid profile (%) of four different commercially available pine nuts

Nomenclature	Common name	Pinus pinea (NZ)	Supermarket* #1	Supermarket* #2	Supermarket* #3
C16:0	Palmitic	4.94	4.19	4.35	4.53
C18:0	Stearic	2.97	2.26	1.92	2.01
C18:1c9	Oleic	36.51	23.99	24.97	26.78
C18:2c5,9	Taxoleic	0.10	1.53	1.82	1.92
C18:2c9,12	Linoleic	48.89	46.08	44.10	46.99
C18:3c5,9,12	Pinolenic	0.56	18.44	13.10	13.94
C18:3c9,12,15	Linolenic	0.96	0.17	0.10	0.10
C20:0	Arachidic	0.27	0.21	0.21	0.22
C20:1c11	Gondoic	1.09	0.97	1.04	1.11
C20:2c5,11	Keteleeronic	0.17	0.12	0.11	0.11
C20:2c11,14	c11,14-Eicosadienoic	0.63	0.48	0.51	0.54
C20:3c5,11,14	Sciadonic	2.56	0.97	0.87	0.94
Diagnostic Index		0.37	2.96	2.26	2.26

The Diagnostic Index (DI) is an index proposed to define the authenticity of pine nuts. The New Zealand-grown pine nuts DI indexes compare well with international results (Table 1).

The DI indexes of the three (pine nuts imported into New Zealand), combined with the morphological differences shown in the attached pictures) clearly indicate they are not Stone pine (*Pinus pinea)* and are possibly a mixture of cultivars.

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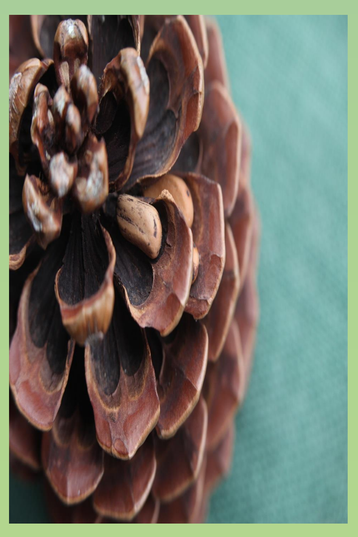
Table 1. Fatty acid profile of 5 different New Zealand grown pine nuts (%)



		Chinese White Pine (*Pinus armandii*)	Mexican Stone Pine (*Pinus cembroides*)	Coulter Pine (*Pinus coulteri*)	Stone Pine (*Pinus pinea*)	Torrey Pine (*Pinus torreyana*)
C16:0	Palmitic	3.27	4.46	3.36	5.12	5.26
C18:0	Stearic	1.89	1.83	1.14	3.37	1.96
C18:1c9	Oleic	19.63	42.38	36.36	36.11	50.66
C18:2c5,9	Taxoleic	2.46	0.05	2.27	0.11	0.75
C18:2c9,12	Linoleic	51.70	41.95	39.74	49.98	35.73
C18:3c5,9,12	Pinolenic	17.93	0.24	11.75	0.40	2.35
C18:3c9,12,15	Linolenic	0.17	0.17	0.35	0.74	0.23
C20:0	Arachidic	0.25	0.26	0.25	0.34	0.41
C20:1c11	Gondoic	0.72	0.69	0.79	0.92	1.19
C20:2c5,11	Keteleeronic	0.14	0.04	0.40	0.15	0.21
C20:2c11,14	c11,14-Eicosadienoic	0.58	0.38	0.29	0.62	0.22
C20:3c5,11,14	Sciadonic	1.26	0.41	1.33	2.35	1.01
Diagnostic Index	(DI*)	3.05	0.08	2.32	0.35	0.50

*DI = [(5,9-18:2+5,9-18:3+5,11,14-20:3)/(18:1n-9+18:2n-6+20:2n-6)]x10

*Diagnostic Index (DI) reference : Destaillats, F. (2010). Identification of the botanical origin of pine nuts found in food products by gas-liquid chromatography analysis of fatty acid profile. *Journal of Agricultural and Food Chemistry* 58, 2082-2087.

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